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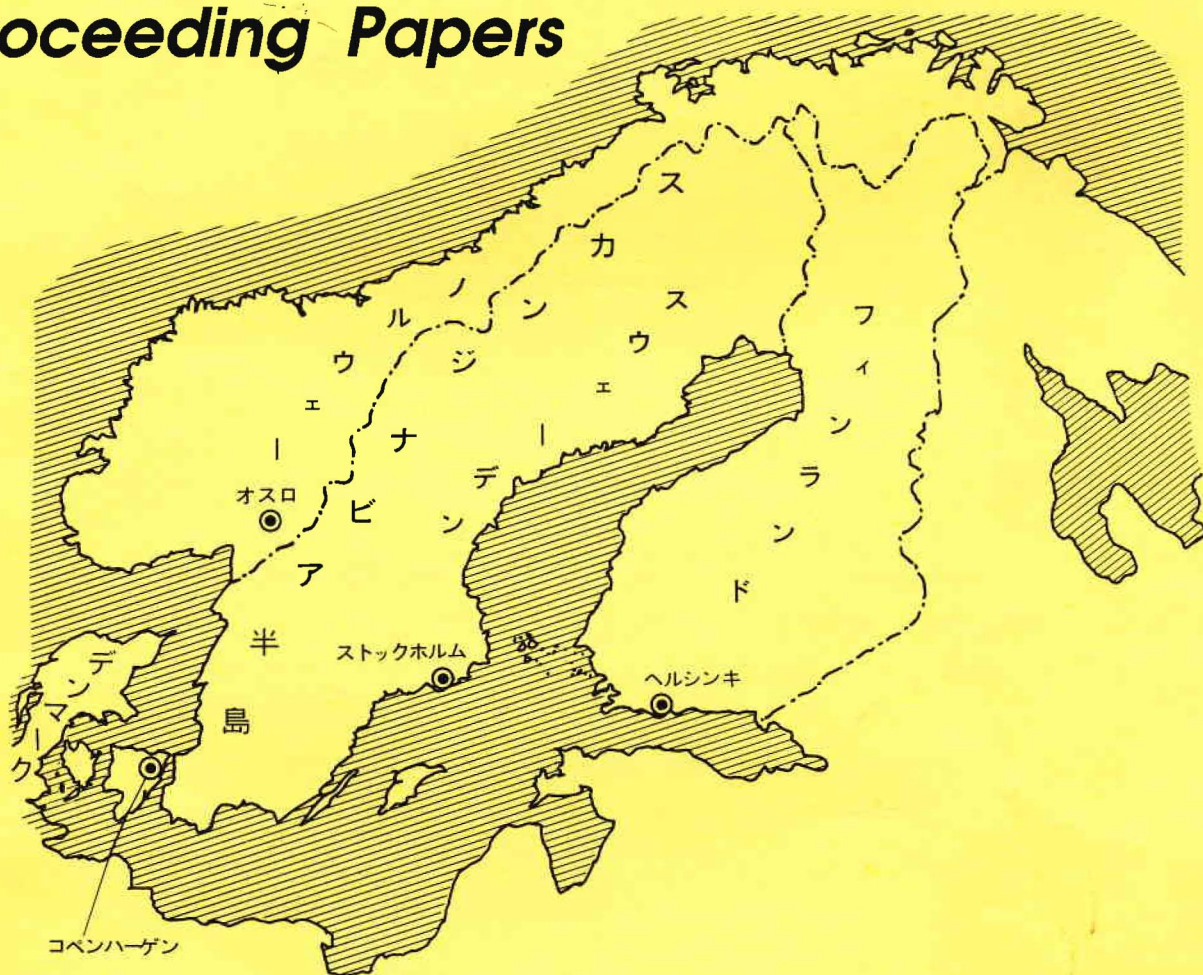
JAPANESE SCANDINAVIAN RADIOLOGIC SOCIETY

日本スκανジナピア放射線医学協会

会報7号, 1993年

The 1st Japan - Scandinavia Symposium of Medical Radiology

Proceeding Papers



**The 1st
JOINT MEETING OF JAPANESE
SCANDINAVIAN RADIOLOGIC
SOCIETY SYMPOSIUM AND
→ 4th JAPAN - NORDIC PACS
SYMPOSIUM**


NOV. 6 - 7, 1993


Tokyo, Japan

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* Opening session6th Nov 8:45-9:00

T.Kozuka, H.Ringertz, T. Kumazaki

A. Contrast material and Cardiovascular.6th Nov 9:00-10:10

Chairpersons : P.Slezak, M.Sako

1. ELIMINATION OF LOW OSMOLARITY CONTRAST MEDIA BY HEMODIALYSIS
Jun Ueda¹, Tomoaki Furukawa¹ and Katsuhiko Sakaguchi²,¹Dept. of Radiology, ²Dept. of Internal Medicine, Sumitomo Hospital, Osaka, Japan
2. ON THE RELATIONSHIP BETWEEN NAUSEA AT INTRAVENOUS ADMINISTRATION OF CONTRAST MEDIUM AND FOOD INTAKE PRIOR TO THE EXAMINATION
TADA Shimpei, OOWAKI Kazuhiko, OJIRI Hiroya, YAMAGISHI Jiro, FUKUDA Kunihiko
Department of Radiology, The Jikei University School of Medicine
3. A DIMERIC, NON-IONIC CONTRAST MEDIUM(IOTROLAN) AS INTESTINAL PERMEATION MARKER IN ACTIVE CROHN'S DISEASE
F.Laerum¹, O.Fausa¹, S.Ferstad¹, I.Nordøy¹, K. E.Solheim², A.Stordahl³, L.Aabakken³, E.Aadland³, S.Aasen¹
¹Rikshospitalet, ²Aker sykehus, ³Ullevaal sykehus, ⁴HQ Defence Command Norway, Oslo, Norway(INVITED)
4. TRANSVENOUS CORONARY ANGIOGRAPHY BY ENERGY SUBTRACTION METHOD USING SYNCHROTRON RADIATION WITH SPECIAL REFERENCES TO THE PROGRESS OF THE SYSTEMS AND IMAGE QUALITY
Akisada,M.¹, Takeda,T.², Hyodo,K.³, Ando,M.³, Nishimura,K.⁴, Hasegawa,S.⁵, Konishi,K.⁶, Toyofuku,F.⁶, Umetani,K.⁷, Ueda,K.⁷, Akatsuka,T.⁸, Nakajima,T.¹, Takenaka,E.⁹
¹ Tama Health Management Ctr ² Univ. Tsukuba, ³ KEK, PF, ⁴ Saitama Med. School
⁵ Univ. Electro Communication ⁶ Kushu Univ. ⁷ Central Res.Lab.,Hitachi Co.Ltd ⁸ Yamagata Univ., ⁹National Defence Med. Coll.
5. CLINICAL EVALUATION OF ATYPICAL PATTERNS OF AORTIC DISSECTION BY CT AND MR IMAGING
T.Yamada, Dept. Radiology, The Jikei University School of Medicine, Tokyo, Japan
6. ELECTRON BEAM CT FOR CARDIOVASCULAR DIAGNOSTIC IMAGING
Makoto Takamiya, MD Department of Radiology, National Cardiovascular Center, Osaka

B. IVR-1.6th Nov 10:10-11:10

Chairpersons : F. Laerum, H. Uchida

7. COILS FOR MANAGEMENT OF GASTROINTESTINAL BLEEDING. A PRESENTATION OF FIVE CASES
B.Kalin, Dept. of Radiology, Karolinska Hospital, S-171 76 Stockholm, Sweden
8. EMERGENT EMBOLIZATION FOR CONTROL OF MASSIVE INTRAPERITONEAL HEMORRHAGE
S.Kimura, H.Higashihara, F.Koganemaru, H.Ono, M.Okazaki, Dept. of Radiology, Fukuoka University, Fukuoka, Japan
9. TRANSCATHETER ARTERIAL EMBOLIZATION FOR THE TREATMENT OF MASSIVE HEMORRHAGE ASSOCIATED WITH SEVERE PELVIC FRACTURES. ANALYSIS OF 106 PATIENTS.
Hiroyuki Tajima MD, Tatsuo Kumazaki MD, Kazuhito Gemma MD, Hiroshi Kawamata MD, Natsuki Tajima MD, Shinsuke Goto MD
Dept. of Radiology, Nippon Medical School, Tokyo, Japan
10. VASCULAR ENDOSCOPY IN VASCULAR INTERVENTION
S.Takekawa, H.Yodono, T.Kimura, H.Noda, R.Sasaki, A.Aoki, Y.Akabane, S.Abe,
Dept. of Radiology, Hirosaki University School of Medicine, Hirosaki, Japan
11. EXPERIMENTAL AND CLINICAL STUDY OF GIANTURCO Z-STENT IN ILIAC ARTERIAL STENOSIS : INTIMAL HYPERPLASIA AND ITS PREVENTION
H.Uchida, K.Kichikawa, M.Maeda, Dept. of Radiology, Nara Medical University, Nara, Japan

* Coffee break6th Nov 11:10-11:25

C. Nuclear Medicine, Oncology, Misc.6th Nov 11:25-12:25

Chairpersons : F.Mathiesen, S.Takekawa

12. INTRA-ARTERIAL INFUSION OF CISPLATIN WITH AND WITHOUT PREOPERATIVE RADIATION FOR URINARY BLADDER CANCER
Y.Monzen¹, S.Matsumoto¹, S.Yoshida¹, M.Wakisaka¹, H.Mori¹, H.Mizoguchi², Z.Ogata², S.Ueda³, Y.Kato³
¹Dept. of Radiology, Oita Medical University ²Dept. of Urology, Oita Medical University
³Dept. of Radiology, Oita Prefectural Hospital, Oita, Japan
13. LETHAL EFFECTS OF PROLONGED TREATMENT WITH HYPOXIC CELL SENSITIZERS
M.Imamura¹, Y.Tanaka¹, M.R.Edgren², L.Révész²,
¹Dept. of Radiology, Kansai Medical University, Osaka, Japan,
²Div. of Tumor Biology, Dept. of Radiation Physics, Karolinska Institute, Stockholm, Sweden
14. A PROSPECTIVE STUDY ON ACUTE THYROID DYSFUNCTION DUE TO RADIOTHERAPY
K.Nishiyama MD¹, E.Tanaka MD¹, Y.Tarui MD¹
¹Dept. of Radiology, Kinki Central Hospital, Hyogo, Japan
15. QUANTITATIVE EVALUATION OF THE REGIONAL LIVER FUNCTION USING ^{99m}Tc-GSA BEFORE AND AFTER TAE BY DYNAMIC SPECT
S.Tomiguchi, M.Nabeshima, R.Nakashima, A.Kojima, A.Tsuji and M.Takahashi,
Dept. of Radiology, Kumamoto University School of Medicine, Kumamoto, Japan
16. THE MEASUREMENT OF LIMB BLOOD FLOW USING TECHNETIUM-99 HUMAN SERUM ALBUMIN
Jan Reidar Bjørke, MD, Dept. of Radiology, Vestfold Central Hospital, Tønsberg, Norway
17. RETROGRADE VISUALIZATION OF THE PORTAL VENOUS SYSTEM WITH DIGITAL SUBTRACTION ANGIOGRAPHY AND DYNAMIC COMPUTED TOMOGRAPHY BY HEPATIC ARTERIAL CARBON DIOXIDE INJECTION IN HEPATIC DISEASE
H.Inoue, N.Miyazono, S.Miyake, K.Ueno, H.Nishida, M.Nakajo,
Dept. of Radiology, Kagoshima University, Kagoshima, Japan

* Lunch (2F. Restaurant)6th Nov 12:25-13:30

D. Implementation of large-scale PACS6th Nov 13:30-14:15

Chairpersons : S. K. Mun, S. Kusano

18. TECHNOLOGY ASSESSMENT AND SYSTEM DESIGN OF HOKKAIDO UNIVERSITY-PACS
K.Miyasaka^{1,2}, T.Kudo², S.Houkin^{1,2}, N.Fujita¹,
Depts. of ¹Radiology and ²Medical Informatics, Hokkaido University, Sapporo, Japan

19. HIS, RIS AND PACS OF OSAKA UNIVERSITY HOSPITAL
H.Kondoh¹, Y.Mori¹, H.Nakamura¹, J.Ikezoe¹, T.Kozuka¹, K.Inamura², ¹Dept. of Radiology, Osaka University, Osaka, Japan ²College of Biomedical Technology Osaka University, Osaka, Japan
20. PACS IN DENMARK. CONDITIONS AND PRESENT STATUS
F.Mathiesen, MRI-Center,
Skejby University Hospital, Århus, Denmark.

E. Teleradiology in community -1.....6th Nov 14:15 - 15:00
Chairpersons : L.Korsoff, K.Miyasaka

21. TELEPATHOLOGY TRIAL IN SWEDEN-PRELIMINARY RESULTS
Christer Busch¹⁾ and Silas Olsson²⁾
¹⁾Department of Pathology, University Hospital, Uppsala, Sweden
²⁾Spri, The Swedish Institute for Research and Development of Health Services, Stockholm, Sweden
22. FAST TELERADIOLOGY/TELECONFERENCE SYSTEM BASED ON UNIVERSITY MICROWAVE LOCAL AREA NETWORK
Masaomi Takizawa, Shusuke Sone, Toshio Kasuga, Fumikazu Sakai, Jun Aoki, Kazuhiro Oguchi, Tadashi Wako*, Yoichi Okazaki*, Rouji Kondo**
Department of Radiology, Shinshu University School of Medicine, Matsumoto,
Department of Radiology, Nagano Red-Cross Hospital* and Faculty of Engineering, Shinshu University**, Nagano, Japan
23. TELERADIOLOGY IN NORTHERN FINLAND
J.Reponen¹, J.Turunen², S.Lähde¹, E.Ilkko¹, J.Sajanti³, I.Suramo¹,
¹Dept. of Radiology, Oulu University, Finland;
²Dept. of Radiology, Kokkola Central Hospital, Finland;
³Dept. of Neurosurgery, Oulu University, Finland

* Coffee break.....6th Nov 15:00 - 15:15

F. Basic technology for PACS.....6th Nov 15:15 - 16:35
Chairpersons : T.Sund, T.Ishigaki

24. DIGITALISATION OF RADIOLOGY-NOW AND IN THE FUTURE (INVITED)
H.Ringertz, Department of Radiology, Karolinska Hospital, Stockholm, Sweden
25. ERGONOMIC ANALYSIS OF CRT WORKSTATION
K.Yamakawa¹, K.Shimamoto¹, H.Hirota¹, M.Ikeda², M.Jingu³, H.Miyatake⁴, T.Ishigaki¹, S.Sakuma¹,
¹Dept. of Radiology,
²Dept. of Medical Informations & Records Nagoya University School of Medicine Nagoya Japan,
³Medical System Division,
⁴Design Center, TOSHIBA Corp.
26. DEVELOPMENT OF HIGH THROUGHPUT NEW FCR SYSTEM
Y.Fuseda, T.Suzuki, H.Katoh
Fuji Photo Film Co.,Ltd. Miyanodai Technology Development center
27. TECHNOLOGY ASSESSMENT OF PACS SUPPORTED BY THE EUROPE COMMUNITY
E.M.S.J.van Gennip, A.R.Bakker, BAZIS, Leiden, The Netherlands.
28. CLINICAL EVALUATION OF NEWLY DEVELOPED CRT WORKSTATION : CT READING AND OBSERVER'S PERFORMANCE
K.Shimamoto¹, K.Yamakawa¹, M.Ikeda², T.Ishigaki¹, S.Sakuma¹, M.Suzuki³, H.Kura³, H.Kimura³
¹Dept. of Radiology, Nagoya University School of Medicine, Nagoya, Japan, ²Dept. of Medical informations & Medical Records, Nagoya University Hospital, Nagoya, Japan, ³Medical Systems Division, TOSHIBA CORPORATION, Tokyo, Japan

G. Small network tech.6th Nov 16:35 - 17:35
Chairpersons : S.Olsson, M.Kimura

29. AUTOMATIC SYNTACTIC PARSING OF RADIOLOGICAL DIAGNOSES
Y.Saida¹, M.Kimura², I.Anno¹, Y.Itai¹,
¹Department of Radiology, Institute of Clinical Medicine, University of Tsukuba, Tsukuba Ibaraki, Japan
²Department of Medical Informatics, School of Medicine, Hamamatsu University, Hamamatsu, Japan
30. EVALUATION OF PERSONAL COMPUTER CRT MONITOR
Yu Kurashita, Takashi Kitanosono, Minoru Honda, Kazumasa Suzuki, Hidetoshi Konishi, Toyohiko Hishida
Department of Radiology, Showa University School of Medicine
31. ESTABLISHMENT OF ENDOSCOPIC IMAGE FILING SYSTEM
Masahiro Kaneko*, Hiroshi Hirano*, Hajime Yamaguchi*, Ryosuke Ono*, Yanao Oguro*, Shigeaki Yoshida**, and Nagaaki Ohyama***
*National Cancer Center : **National Cancer Center East Hospital :
***Tokyo Institute of Technology, Tokyo, Japan
32. NETWORK SYSTEM WITH FCR/DMS
T.Funahashi, E.Asai, H.Katoh
Miyanodai Technology Development Center, Fuji Photo Film Co.,Ltd.

* Evening Party(2F. Restaurant).....6th Nov 18:00 ~

H. Applications on the workstation.7th Nov. 9:00 - 10:05
Chairpersons : H. U. Lemke, M. Kaneko

33. UTILIZATION OF 3D DATA IN CLINICAL PRACTICE
H.Nishitani¹, I.Kasem¹, K.Kashihara¹, S.Tanagami¹, K.Matsuzaki¹, J.Ueno¹, N.Niki², F.Hichijo³, K.Matsumoto³,
¹Dept. of Radiology, ²Dept. of Engineering, ³Dept. of Neurosurgery, Univ. of Tokushima, Tokushima, Japan
34. DEVELOPMENTS IN COMPUTER ASSISTED RADIOLOGY
Heinz U.Lemke
Technical University Berlin
35. POST-PROCESSING OF STORAGE PHOSPHOR RADIOGRAPHY : A SIMPLIFIED APPROACH
T.Kaji, S.Kosuda, S.Kusano,
¹Dept. of Radiology, National Defense Medical College, Saitama, Japan
36. ACCURACY OF DIGITAL SKELETAL RADIOGRAPHY (INVITED)
H.Pettersson
Department of Radiology, University of Lund, Sweden

TECHNOLOGY ASSESSMENT AND SYSTEM DESIGN OF HOKKAIDO UNIVERSITY- PACS

K. Miyasaka^{1,2}, T. Kudo², S. Houkin^{1,2}, N. Fujita¹, Depts. of ¹Radiology and
²Medical Informatics, Hokkaido University, Sapporo, Japan

Based upon 4 years experiences of Hokkaido University-picture archiving and communication system(HU-PACS) we describe a present status of utilization and management of images, function of the network, maneuverability of the workstations and the next step of the PACS.

More than 700000 images have been accumulated in the data base of the PACS and they are available on line for clinical usage. Storage space of CT films is not needed any more in the radiology departemnt and the films are sent to the reffering department with a report. Retrieval rate of images is ranged from 30% to 80% depending on the section where the workstations are distributed; although the workstations are still limited in number at 20. Interpretation of CT utilizing the workstations has been routinely made at the radiology department. Time needed for a CT reading for a patient was 4.9 minutes on average on the workstation, while it was 4.0 minutes on film. Therefore, further improvement of maneuverability of the workstations is essential for filmless PACS and CRT diagnosis. A plan of the PACS subsystem will also be presented where about 30 new workstations are implemented to the present PACS.

HIS, RIS AND PACS OF OSAKA UNIVERSITY HOSPITAL

H. Kondoh¹, Y. Mori¹, H. Nakamura¹, J. Ikezoe¹, T. Kozuka¹, K. Inamura², ¹Dept. of Radiology, OSAKA University, OSAKA, Japan, ²College of Biomedical Technology OSAKA University, OSAKA Japan.

We developed a HIS and RIS which is for the purpose of HIS, RIS and PACS integration.

It includes the order entry system, radiological examination scheduling system, radiological examination assistant system, billing system and reporting system. These systems cover all of the radiological examinations in the hospital. These systems deal with not only the examination order data but also all the data with relation to the patients. The RIS- storage phosphor system and the controller integration make technicians convenient. The order entry system and the connection to billing system make patients save time and labor.

The images are the relational data to the examination orders like the reports. The confirmation of these information systems seems to be fundamentals to completion of valuable PACS.

PACS IN DENMARK

Conditions and present status

**F.Mathiesen, MRI-Center,
Skejby University Hospital, Århus, Denmark.**

Like the rest of Scandinavia, Denmark has only one health care system, that is public, and only one health insurance, the tax system. So in each geographic area, there will be only ONE hospital with a X-ray department. Unlike the conditions in USA and Japan, each person in Denmark has a Central Personal Registrationnumber (CPR) made from our date of birth and a 4 digit codenumber. This CPR number is a lifelong key to every personal information and is used for everything, e.g., banks, tax, dentist, army, school, hospitals, family doctor etc. We have a central computer database called "The RED system," it contains information about all contacts with hospitals all over Denmark. A question on your CPR will give an answer to your full medical history.

It is important that a PACS system in Denmark is able to put this information directly on the images. One contact with the CPR ID card can put correct name, adress and family doctor on the examination - error free!

As all hospital contacts are recorded, we can almost always find old X-ray examinations for comparison, and we use this facility intensively, spending fortunes on mailing large film envelopes. So a PACS system in Denmark MUST be able to send images on a nationwide lightcable network in a STANDARD file-format. All the manufactures of radiology hardware must use a common standard. They must be able to link together before PACS will be bought on a larger scale in Denmark, simply because the network will be nationwide and not just per hospital.

So far only FOUR hospitals have installed real PACS equipment - all systems from SIEMENS. Two of the hospitals have installed a 2 Megabit link over a distance of 75 kilometers, this is just the beginning of our nationwide PACS of the future.

TELEPATHOLOGY TRIAL IN SWEDEN - PRELIMINARY RESULTS

Christer Busch ¹⁾ and Silas Olsson ²⁾

¹⁾ Department of Pathology, University Hospital, Uppsala, Sweden

²⁾ Spri, The Swedish Institute for Research and Development of Health Services, Stockholm, Sweden

In Sweden about 30 acute care hospitals, out of 105 in total, have their own surgical pathology laboratory service regarding cytology and histopathology diagnosis. Along with more specialized and sub-specialized pathology service, the need for consultations between pathologists has increased. Telepathology represents a potential for intensified communication between pathologists.

Six telepathology stations with static image transfer mode are being leased and three permanent stations have been purchased and installed. During the trial period, from September 1992 to October 1993, all surgical pathology laboratories in acute care hospitals in Sweden will be testing telepathology. The telepathology workstations selected for this trial are PC-based, and the telecommunication network used is ISDN (2x64 kbit/sec).

The telepathology trial in Sweden is set up to study several conditions e.g. the specific need for telepathology, the practical handling and usage, the image quality, and to study eventually limitations with a static imaging system for consultations between pathologists. A technology assessment study is part of the trial.

In this trial, a study of the expectations among the Swedish pathologists on telepathology is included. Generally, the image quality and the time for image transfer do not seriously limit the possibilities for consultations. Small laboratories have welcomed the possibilities for rapid advice.

FAST TELERADIOLOGY / TELECONFERENCE SYSTEM BASED ON UNIVERSITY MICROWAVE LOCAL AREA NETWORK

Masaomi TAKIZAWA, Shusuke SONE, Toshio KASUGA, Fumikazu SAKAI, Jun AOKI, Kazuhiro OGUCHI, Tadashi WAKO*, Yoichi OKAZAKI*, Rouji KONDO** and Yasushi FUWA**

Department of Radiology, Shinshu University School of Medicine, Matsumoto,
Department of Radiology, Nagano Red-Cross Hospital* and Faculty of Engineering,
Shinshu University**, Nagano, JAPAN

A system for fast telecommunication of radiographic and color photographic images using readily available the microwave local area networks is reported. The Shinshu University Hospital (S.U.H., Matsumoto) and the Ngano Red-Cross Hospital (N.R.H., Nagano) were linked with a 1.53Mbps data transmission line for cooperation of daily practice, research and education. This teleradiology system consists of following blocks : 1. A channel of intrafaculty local area network of the Shinshu University (SUNS, 7.5GHz microwave) between Administration Department (A.D., Matsumoto) and Faculty of Engineering (F.E., Nagano) which is 75km distant from Matsumoto, 2. a pair of small output 50GHz band wireless transceivers for data transmission between the F.E. and the N.R.H.(400m) , 3. a radiology information system of the S.U.H., 4. a pair of communication interface adapters between a PC and microwave telecommunication line.

Both hospitals have a 66 MHz PC, a laser film digitizer with 50 - 200 microns and 12 bit range, an interactive CRT display (21inch) with a 2k x 2k memory, a 3.5 inch magneto-optical disk (MOD) with a 256MB capacity, and a terminal adapter of 1.53MHz for linking a PC with a microwave data transmission system (custom-made by F.E.). Teleradiology software was developed by the S.U.H. and the F.E. The overall transmission time of this system was 1.03 Mbps at maximum, the 870 kbps in average. A chest image of 6 MB (1770 x 1770, 16bit) was transmitted from the N.R.H. to the S.U.H. within a minute without error. The teleconference between radiologists of two hospitals was available by this system. Quality of plain x-ray images of a chest phantom including coin lesions transmitted by this system was evaluated, too.

TELERADIOLOGY IN NORTHERN FINLAND

J.Reponen¹, J.Turunen², S.Lähde¹, E.Ilkkö¹, J.Sajanti³, I.Suramo¹,
¹Dept. of Radiology, Oulu University, Finland; ²Dept. of Radiology, Kokkola Central Hospital, Finland; ³ Dept.of Neurosurgery, Oulu University, Finland

Purpose. The purpose of the study was to evaluate teleradiology based on low-cost personal computers.

Materials. In the first phase over one hundred radiological examinations were digitized and transmitted via a digital 64 kbps telephone line. The material consisted of conventional radiographs from a rural health centre and CT or angiographic examinations from a central hospital.

In the second phase a series of 50 CT images with brain hemorrhage were sent from a central hospital using same equipment.

Methods. Images were digitized in an industrial standard IBM-486 clone computer using a 300 DPI flat-bed CCD scanner and a commercial image-processing program. Matrix sizes varied between 512x512 and 2048x2048 pixels. A 256-step gray scale was used. Transmission occurred via a digital dial-up telephone line with a help of a proprietary made communication program. The program enabled automatic receiving. JPEG compression was used to minimize the transmission time.

At the university clinic the first series was interpreted by two staff radiologists on a 20" computer screen. Slight image manipulation was made when needed. A report was given and sent via telefax back to the sender. Original radiographs were available for comparison a few days later.

The second series was evaluated by two staff radiologists in the same manner. Also a neurosurgeon examined the images together with supplied clinical data and made treatment decisions. The reports and decisions were later compared with the actual patient data at the central hospital.

Results. The technical quality of the images was mostly sufficient to give diagnosis. However, limited contrast resolution resulted in deterioration of quality when high contrast images were digitized. The transmission time of the images was between 1 and 5 minutes and compression gave reasonable gain in time used. In neurosurgical cases, teleradiology could in some cases save patient from transportation.

Conclusions. The progress in microcomputer technology and programs has made high quality teleradiology possible with fewer costs compared to workstation based systems. Image quality will improve, if we in the future can capture the direct digital image for transmission.

Ergonomic analysis of CRT workstation

K. Yamakawa¹, K. Shimamoto¹, H. Hirota¹, M. Ikeda²

M. Jingu³, H. Miyatake⁴, T. Ishigaki¹, S. Sakuma¹,

¹Dept. of Radiology, ²Dept. of Medical Informations & Records

NAGOYA University School of Medicine NAGOYA Japan ,

³Medical System Division, ⁴Design Center, TOSHIBA Corp.

Ergonomic analysis of CRT workstation is important for implementation of PACS. In this study, ergonomic analysis of workstation with six CRT monitors was performed.

A prototype workstation with six CRT monitors was newly developed (Toshiba Nasu Works). It consists of upper three monitors and lower three monitors. Six monitors can move with circular arc movement with 56cm diameter in vertical direction. With this workstation CT reading studies were performed by 15 radiologists. To study the relation between eye position and CRT, two kinds of body CT images were presented for reading studies. The best position of eye and CRT was decided subjectively by each observer in each task. After reading CT images an interview was performed in each observer about the degree of fatigue.

An optic angle between upper CRTs and the horizontal plane was about 8°. It agreed with previous study of the monitor panel of central monitoring room in the industry. An optic angle between lower CRTs and the horizontal plane was larger than that reported previously on one CRT workstation. According to the observer's attention to upper CRTs, the optic angle between lower CRTs and horizontal plane changed significantly.

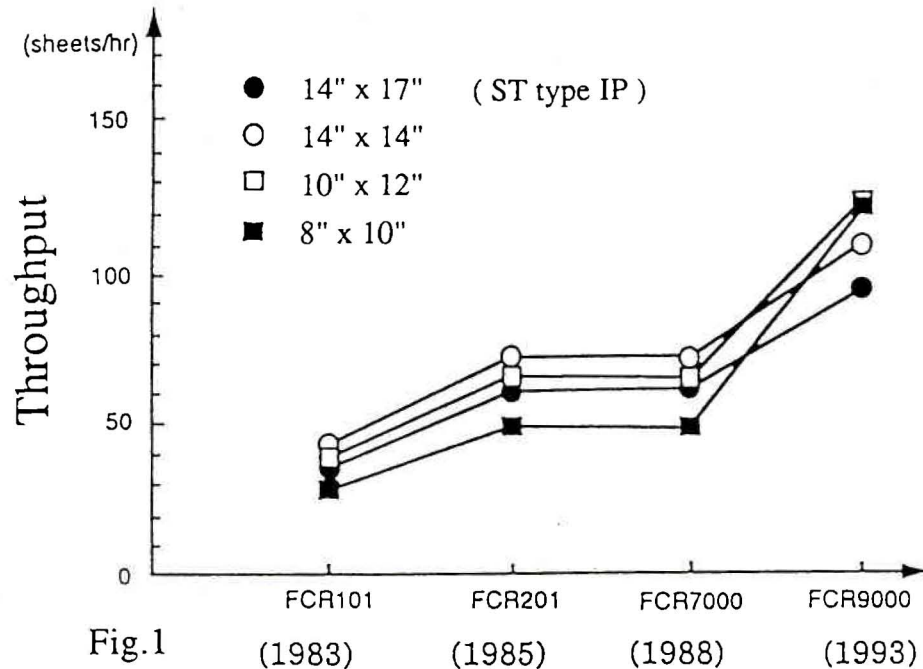
In image interpretation and reporting with CRT workstations, the fatigue of observers influences the diagnostic performance. Although many factors influence the fatigue of observer, ergonomic factors must be taken into consideration to design the workstation.

DEVELOPMENT OF HIGH THROUGHPUT NEW FCR SYSTEM

Y.Fuseda, T.Suzuki, H.Katoh

Fuji Photo Film co, ltd. Miyanodai Technology Development center

This spring, we announced the FCR 9000 system. Comparing with our former FCR 7000 system, we achieved high performance as following Fig. 1



Like FCR 7000 system, this FCR 9000 system also has IP auto feeding and loading mechanism, and IP stackers. And to achieve the above performance, we use the following new technologies.

(1) type-V Imaging Plate

This is laser diode sensitive, and has smaller grain of phosphor and high efficiency. Generally we achieved 15% up graininess.

(2) new type scanner

High power laser diode (680 nm) and high speed polygon mirror are used.

And, in the FCR 9000 system, we newly offer the following image processing function.

(1) Dynamic Range Control processing function

(2) Tomographic Artifacts Suppression processing function

TECHNOLOGY ASSESSMENT OF PACS
SUPPORTED BY THE EUROPE COMMUNITY

E.M.S.J. van Gennip, A.R. Bakker, BAZIS, Leiden, The Netherlands.

In today's health care, rising costs require that investment decisions are made by carefully balancing of costs and benefits. New technologies will only be used at a large scale, if they have shown to be cost-effective. Hence, evidence of cost-effectiveness of PACS is requested. At present, this evidence is still lacking. This paper reports on two activities, "TEASS" and "ATIM" sponsored by the European Community to analyze costs and benefits of PACS.

TEASS is a topic in the project EurIPACS (1992-1994). In TEASS 3 European hospitals work together in analyzing costs and effects of PACS in a pre-post measurement design, following the TEASS evaluation protocol. Each of these hospitals implement and use partial PACS systems. Models are made of working procedures and of information flows, in order to understand and predict the potential impact of PACS in the radiodiagnostic process. A software tool is developed to support cost analysis. Pre-measurements show that the film-based system is labour intensive, involves a large number of professionals, within and outside of radiology. These measurements indicate that PACS may save time, and speed up the radiodiagnostic process.

ATIM (1993-1994) is a so-called "Accompanying Measure" which supports and coordinates assessment activities carried out within the EC Programme on Advanced Informatics in Medicine (AIM) through meetings and workshops. ATIM focusses on two "project-lines" in AIM, one of which deals with Medical Multimedia Workstations and Images. A first workshop in this projectline (October 2-3, 1993) aims to identify TA methodologies to assess "effectiveness" of imaging technologies.

CLINICAL EVALUATION OF NEWLY DEVELOPED CRT WORKSTATION:
CT READING AND OBSERVER'S PERFORMANCE

K.Shimamoto¹, K.Yamakawa¹, M.Ikeda², T.Ishigaki¹, S.Sakuma¹,
M.Suzuki³, H.Kura³, H.Kimura³ ¹Dept. of Radiology, NAGOYA
University School of Medicine, NAGOYA, Japan, ²Dept. of Medical
informations & Medical Records, NAGOYA University Hospital,
NAGOYA, Japan, ³Medical Systems Division, TOSHIBA CORPORATION,
TOKYO, Japan

The newly-developed CRT workstation was installed at the Nagoya University Hospital in 1992 based on the clinical evaluation of the prototype system. The routine interpretation of CT images on CRT was done, and observer's performance of the new system was evaluated.

Each display station (TWS-860, Toshiba) consists of six CRT monitors (17-inch, 1024x1280 pixels x8bits) and has 128 MB of image memory, and 9.6 GB of image disc. Imaging modalities which are connected to the image data processing units include computed radiography, CT, ultrasonography, nuclear medicine, and film digitizer. The data transfer rate is 7.0MB per second. Sixteen CT images can be simultaneously displayed on one CRT monitor.

After reading CT images, a diagnostic report was written by hand. In the head CT series, there was no significant difference between the average time required for image reading on CRT including image display time and that of film reading with a viewbox. Although prolongation of time on CRT reading still existed in the body CT series, it became shorter compared with that of the prototype system.

In conclusion, the new workstation has improved the total diagnostic performance from the viewpoint of its operability, mental & eye fatigue, and ergonomical problems including the environment compared with the prototype system. However, further improvement is necessary in order to implement a larger PACS.

AUTOMATIC SYNTACTIC PARSING OF RADIOLOGICAL DIAGNOSES

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A practical reference system according to the disease names has been long desired by most of radiologists, and this seems to be the basic subject to be accomplished prior to the distribution of PACS. Since many radiologists are not willing to get such a system with any alteration of the routine practice, an automatic syntactic parser should be introduced as an intelligent reporting interface in which radiological diagnoses given as natural language by users can be recognized and categorized into certain coding file system automatically.

A syntactic parser was used to analyze and categorize diagnoses which were added at the end of the radiological reports. This diagnostic description was limited to disease names including anatomical locations. Purely descriptive findings, which were not diseases names, were not handled by the parser. Hundreds of diagnostic vocabularies, which were extracted from an ICD code book, were stored in the parser and a real time spell checker was also equipped. 95% of the actually input CT and MRI diagnoses in the field of gastrointestinal tract were correctly recognized. The remaining 5% was caused by either over- or under-description. In such cases, possible candidates should be given on windows for further selection to the users. Response time of parsing is less than one second after spell checking. This method was quicker and more friendly to users, even compared to hierarchical menu selection by mouse and/or windows.

This feature can be used for diagnostic report file and teaching file management, as well as for electronic semantic medical records. It could be converted from keyboard-based system to voice recognition system, as the technology comes into practical level.

EVALUATION OF PERSONAL COMPUTER CRT MONITOR.

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Purpose : To evaluate characteristics of CRT monitor for personal computers and to determine whether it is acceptable in PACS environment.

Methods : Hardware used were Macintosh II ci(HD:100 MB, RAM:20MB), Raster Ops 19 inch monitor(72 dpi), Truvel TZ-3X, SONY NWP-559. Software used was Adobe Photoshop. Plain X-Ray phantom images, CT Phantom images and slit chart images were digitized through TZ-3X in resolution of 75, 100, 150, 300 dpi and were stored in the magneto-optical disk. Four images with different resolution were displayed simultaneously to be compared.

Results : Among the four different resolutions, images acquired with 300 dpi resolution and the superior quality. In CT phantom images, 75 and 100 dpi resolution images could cover whole area. In 150 and 300 dpi, image degrading accompanying magnification could be minimized but the contrast decreased slightly. In plain X-Ray phantoms decreased in contrast and image degrading was observed in 75 and 100 dpi, and contrast loss in 150 and 300 dpi. In slit chart following line pairs could be defined : 75 dpi : 2.0 LP, 100 dpi : 2.5 LP, 150 dpi : 3.0 LP, 300 dpi : 4.0 LP.

Discussion : In digitizing with 300 dpi, focusing of scanner lens was subtle and image quality was difficult to maintain and the memory volume was extremely large so that it took a long time to operate. In our system, 150 dpi seemed the optimal resolution when volume, operability, image quality were considered. In displaying X-Ray phantom images there were loss of image quality but CT phantom images, image degrading was not serious with 150 dpi resolution and seemed to be acceptable clinically.

Conclusion : In our system, 150 dpi resolution was optimal considering the speed of operation and image quality. Personal computer monitor was acceptable for CT phantom images but image quality was degraded in X-Ray phantom images.

Establishment of Endoscopic Image Filing System

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With the development of TV endoscope (electronic endoscope) having a small CCD at its tip part, a digitization of endoscopic images becomes easy, and a recording system has been established for such digitized images using a 130mm magneto-optical disk(MOD). The merits of this system are; 1. images can be stored safely for a long period of time with less space and expenses, and 2. it has a complete interchangeability using the IS&C system, which helps for communication with East Hospital.

The process for in-put of the basic information of a patient is a big problem, which should be improved by an earlier connection with the hospital information system (HIS), which will be an indispensable factor for a wider introduction of this system.

POST-PROCESSING OF STORAGE PHOSPHOR RADIOGRAPHY; A SIMPLIFIED APPROACH

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Most of the post processing reports are concerned with investigating the validity of the preset menu and investigators have spent a lot of time looking for the most useful parameters. In this paper, we present a simplified approach to SPR post processing. A simplified method of the post processing of storage phosphor radiography (SPR) enables us to provide with the SPR images of optimized density in the diagnosis of the region of interest. When software can be developed, it can play a significant role on the monitor diagnosis as well as in looking for better processing parameters.

COOPERATIVE TELERADIOLOGY: DIGITAL IMAGES, LIVE VIDEO, AND AUDIO.

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For the last 40 years, teleradiology has been synonymous with the transmission of images over distance for remote viewing, consultation and diagnosis. Until recently the image quality has not been satisfactory, but with high-resolution scanners, digital imaging and purely digital transmission, it is now possible to maintain full image quality in the transmission.

The research lab of Norwegian Telecom has been involved in teleradiology projects for several years. Our image viewer ("Mira") is now in routine use in several hospitals for diagnostic and consultation purposes. Through our experience we have found, however that coordinated sending and viewing of images alone does not adequately cover the needs of consulting radiologists. We are therefore working to radically extend the concept of teleradiology. We include other media, like stored and live video (e.g. film clips, videophone), sound, and any kind of still image. We also generalize the two-part consultation into a networked conference, with the possibility for many participants. Finally, data to be viewed can be prestored at each conference site, so that coordinated viewing can take place even over telephone-speed communication lines.

For the implementation of the teleradiology conference system, the image viewer is extended to handle the different media involved. Several video formats will be supported. We are currently simulating video as a succession of JPEG-compressed frames. A variety of sound formats and sampling frequencies is also supported, including our own implementation of MPEG-1 audio compression. For still images we currently support JPEG compressed and 8-bit raw, and plan support for DICOM.

There will be a "media router" specific to each type of transmitted data (video, sound, etc). The router will accept data from any source (i/o port, file), and can route to one, or to many recipients. The router is responsible for requesting transport service with sufficient quality (speed, error level), or may select a lower data quality to stay within the available channel capacity. All transmission requests go through a transport server, which will deny requests that exhaust its capacity.

A module for conference management will run on each participating site. Its job is to (1) manage the joining and leaving of conference partners, (2) connect and disconnect media routers, (3) supervise and manage resources (communication bandwidth, computer, screen), and (4) control the conference floor. It is currently under development, based on the "Sticky Protocol" specification from BBN Systems and Technologies. Our implementation will be in the form of a software library, which will be made available to interested parties when it is stable.

When the strategies outlined above are followed, it will be possible to establish teleradiology conferences between partners using different hardware and software platforms. We are now performing trials with interconnecting an Osiris viewer running on a Macintosh at the University Hospital in Geneva, with a Mira viewer running on a Sun computer in Tromsø. The synchronization protocol is based on Hermes, which was developed by Swedish Telecom as part of the European Telemed project. When our conference system is fully developed, the Mira-Osiris consultation can be made part of a full-scale conference including other media, and several participants.

THE WORLD OF TELEMEDICINE

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Recent advances of computer technologies and telecommunicational environment made it possible to design a borderless digital world spread over the terra.

The benefits of such technologies affected on medical fields lead the physician to perform the telemedicine routinely. Especially using satellite system and internet system combined with ISDN network, we can do the high speed data transferring through such networks, and these must affect tremendously on the fashion of medicine. All kind of data including still images, motion images, voice and sound must become the targets in telemedicine. Under such environments, the idea to combine these technologies with our PACS and IS&C project must proceed simultaneously.

The current status of satellite network and internet system applied in medical fields will be reviewed.

DIAGNOSTIC RELIABILITY OF A TELERADIOLOGY WORKSTATION IN PULMONARY DISEASES

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Purpose of the study

Certain lung diseases, like pneumothorax and pulmonary fibrosis, pose a special problem to the quality of chest images. The aim of this study was to evaluate the diagnostic reliability of transferred digital chest images displayed on a high-resolution teleradiology workstation. The study was designed as clinical as possible, including on call working hours.

Materials and methods

Chest radiographs of 43 patients were digitized and sent from Paimio Hospital to the main compound of Turku University Central Hospital. 15 of the patients had a pneumothorax, 12 had an interstitial lung disease and 16 were normal. Both pa and lateral projections were available from 37 patients and only ap view from 6 patients.

The images were interpreted by five radiologists during their on call duty shift. The first reading session consisted of images with 1024x1024 pixel resolution and second of images with the 2048x2048 matrix followed by the original chest radiographs. The interval between each session was at least one month. Receiver operating characteristic (ROC) curves were obtained from answers based on five-point confidence scale.

Results

In the pneumothorax group the average area under individual ROC curve was 0.928 (range 0.836–1.000) with the 1024x1024 matrix and 0.983 (range 0.960–1.000) with the 2048x2048 matrix. One radiologist detected all the pneumothoraces correctly in all sessions. Other radiologists seemed to perform somewhat worse with the 1024x1024 matrix than in the other sessions but the differences were not statistically significant.

The diagnosis of pulmonary fibrosis proved to be difficult even with the original analog images. Individual performances varied considerably. Some even seemed to benefit from the digital monitor images. In this group the average area under individual ROC curve was 0.877 (range 0.832–0.972) with the 1024x1024 matrix and 0.831 (range 0.674–0.895) with the 2048x2048 matrix. No statistically significant differences were found in ROC studies.

Conclusion

The general performance of the observers was quite high in all sessions. Our results suggest that accurate diagnosis of pulmonary diseases is possible with the teleradiology workstation. For an experienced radiologist even the 1024x1024 matrix may prove to be sufficient.

PACS IN THE NORDIC COUNTRIES

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The health care systems of the Nordic countries are rather similar to each other, as well as how they deliver their radiology services. However, a study showed that in 1987 the total volume of radiology examinations were significantly higher in Finland comparing to the other Nordic countries.

The need of PACS depends a great deal upon the radiology and health care organization at large. For example, in the Nordic countries it is very common to have an every-day meeting (round), where radiologists meet with clinicians to discuss findings and decide upon further examinations. Also, a written report is issued and sent from the radiology department to the referring physician following every radiology examination.

Furthermore, the running of the image/film archives in Nordic hospitals works very well, although the cost of man-power is rather high.

Therefore, the need of PACS in the Nordic countries has, so far, not been focused on changing the film archives into digital archives.

Instead, the focus has laid upon the evaluation of digital image modalities like CR, putting teleradiology into operation - at least in Sweden, and regarding PACS, the focus has laid upon the development of small communication-links mainly between radiology units within the same hospital. However, in Denmark three hospitals are heavily involved in large PACS-projects with the aim to go filmless. In Sweden, a significant interest is to link teleradiology to PACS.

PACS IN JAPAN

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It was in 1983 when the First International PACS Symposium was held in Japan. That was the next year of 1982 in which the term "PACS" was used by Dr. S. J. Dwyer III in SPIE Symposium held at Newport Beech. Build-up of PACS related development was so fast even here in Japan that we thought we could enjoy the benefit of PACS soon in university hospitals. It took, however, 6 years to have practical PACSs in university hospitals such as HU-PACS (Hokkaido University PACS) which was installed and operated in 1989. Meanwhile, many PACSs here in Japan have been installed as shown in Table 1. Total number of them (109 systems) in 1990 is doubled to 212 systems in 1993, only three years after. Number of CR (computer radiography) units in 1991 was 474, and that in 1992 was 850. We estimate now more than 1,000 units in 1993.

The specific points we have drawn lessons from PACS projects here in Japan are:

(1) The experimental PACS and the practical PACS are the completely different systems. We cannot modify or convert or expand the experimental PACS to the practical PACS. (2) We have to design PACS at the same time with the RIS and HIS. Or, design of PACS must follow that of RIS and HIS. (3) Installed number of units of the computed radiography (CR) has much influence to the successful image data acquisition. (4) Standardized interfaces for image data acquisition is the key to reduce cost of software development. (5) Number of units and classification of resolution specification of image display workstations are very sensitive to the total cost of PACS. (6) Image data compression by JPEG 12 bits design will be most promising technology in terms of cost and speed and interchangeability.

Following items are what we do not want:

(1) To install CRT displays with the highest image quality for all referring physicians in the hospital. (2) To replace chest films completely to CR or digitized films. We cannot urge to go to the filmless system in general chest examinations. (3) To supply the fastest speed of image delivery to everywhere in the hospital, especially in our case of teaching and research hospital having much percentage of chronic cases. (4) To push PACS too strongly to diminish the role of RIS and HIS. What we can do by HIS and RIS must not be replaced by PACS. PACS is still expensive, and the results of diagnosis by radiologists must come first in the context of radiological reports rather than images themselves. (5) To install too many CRT workstations in the hospital to lengthen the response time of image delivery. Many other problems remained and newly found by us have to be solved by ourselves.

Table 1. Number of PACS installations in Japan.

	Size of PACS	1990	1993
1	Stand alone system	96	176
2	Medium sized PACS	12	35
3	PACS linked with HIS	1	1